

Electrical Conductivity in Highly Concentrated Nonaqueous Ionic Mixtures Near the Critical Consolute Point

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The electrical conductivity Λ of highly concentrated nonaqueous ionic mixtures is measured in a wide temperature range above the upper critical consolute point. The studied mixtures are solution of tetra-*n*-butylammonium picrate or ethylammonium nitrate salts in organic solvents with a low dielectric constant.

The background conductivity can be described by the Vogel-Fulcher-Tammann equation. In the one phase region the deviation of the conductivity from the regular behavior shows a critical anomaly [1] whose amplitude is less than 3% for $\tau < 10^{-2}$, with $\tau = (T - T_c)/T_c$, the reduced temperature and T_c the critical temperature. In this temperature range, the anomaly of the conductivity shows a critical exponent close to $\theta = (1 - \alpha)$, in accord with the short-range fluctuation theory for the conductivity [2]. The critical anomaly is found universal as it does not depend on the viscosity, the dielectric constant and the free ion concentration of the mixtures.

The degree of association at the critical point is estimated from the conductivity and the viscosity measurements. It varies from 0.22 for the critical mixture ethylammonium nitrate + *n*-octanol to 0.76 for the mixture tetra-*n*-butylammonium picrate + dodecanol.

- [1] A.Oleinikova and M.Bonetti, *Phys.Rev.Lett.* 83, 2985 (1999).
- [2] M.E.Fisher and J.S.Langer, *Phys.Rev.Lett.* 20, 665 (1968).